

What is claimed is:

1. An electrostatic charge remover using soft X-ray, said remover comprising:  
a head part neutralizing and weakening electrostatic charges of bodies that  
are objects of removal of electrostatic charges by generating soft X-ray having  
wavelengths in the range of  $1.2\text{\AA} \sim 1.5\text{\AA}$  with high energy from a soft X-ray tube  
that is an ion generating tube using thin film of Be evaporated with W as window  
material, and ionizing gas molecules directly and also removing electrostatic  
charges in atmosphere of inert gases ( $\text{N}_2, \text{Ar}$ );  
a soft X-ray protecting part wrapping said head part and preventing that  
soft X-ray is leaked from said head part in order that worker may not be bombed by  
radiation;  
a power controlling part being connected to said head part and said soft X-  
ray protecting part electrically and providing target voltage to control the ion  
generation of filament voltage of a soft X-ray tube and soft X-ray tube with the soft  
X-ray tube in order to control the ion generation so that said head part may generate  
soft X-ray appropriately, and  
wherein it is characterized in that said remover removes the electrostatic  
charges on the surface of charged bodies by generating ions or electrons by ionizing  
gases surrounding charged bodies.
- 20 2. An electrostatic charge remover using soft X-ray as set forth in claim 1,  
wherein it is characterized in that said soft X-ray protecting part is made of iron  
plates with thickness of 1mm and an interlock switch controlling whether said  
power controlling part operates or not and a door putting on/off said interlock

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switch are installed in said soft X-ray protecting part for safety and in a state said door is opened, said head part does not generate soft X-ray.

3. An electrostatic charge remover using soft X-ray as set forth in claim 2, wherein it is characterized in that said power controlling part controls anode voltage (target voltage) and filament current by using PWM modulator and pulse width controlling method and switches to a frequency of 30KHz by constructing a half bridge circuit with FET and the PWM modulator and the half bridge circuit are mounted for filament power and anode voltage generation respectively.
4. An electrostatic charge remover using soft X-ray as set forth in claim 3, 10 wherein it is characterized in that anode voltage generating part of said power controlling part is fed-back through tube voltage sensor and makes a target operate at constant voltage of 9.5KV and a separated transformer being a constant voltage source device to a filament current is fed-back through a filament current sensor and a tube current sensor and makes a filament operate at constant current of  $150 \mu A$ , 15 and current is fed-back through a tube current sensor and the generated quantity of the soft X-ray does not change although it is used for a long time.
5. An electrostatic charge remover using soft X-ray as set forth in claim 4, wherein it is characterized in that said anode voltage generating part of said power controlling part comprises:
  - 20 a high transformer generating high voltage;
  - a tube voltage sensor detecting high voltage generated by said high transformer;
  - a high voltage doubling rectifier, wherein voltage is fed-back to said

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rectifier through said tube voltage sensor and said rectifier operates at a constant voltage;

a transformer generating filament current;

5 a filament current sensor detecting filament current generated by said transformer; and

a part inletting electric wires by insulating from high voltage and fixing ceramic soft X-ray tube.

6. An electrostatic charge remover using soft X-ray as set forth in claim 1, wherein it is characterized in that said soft X-ray tube consists of vacuum tubes for 10 generating soft X-ray by generating ions and a ceramic tube is used for controlling heat generation of said soft X-ray tube.

7. An electrostatic charge remover using soft X-ray as set forth in claim 1, wherein it is characterized in that the effective maximum installation distance of said electrostatic remover is 2000mm.

15 8. An electrostatic charge remover using soft X-ray as set forth in claim 1, wherein it is characterized in that said remover ionizes surrounding gases near a charged body to generate ions or electrons and removes electrostatic charges on the surface of said charged body.

9. A soft X-ray tube manufacturing method used in an electrostatic charge 20 remover using soft X-ray removing electrostatic charges on the surface of a charged body by generating ions or electrons after irradiating lights with high energy (wavelength in the range of 1.2Å ~ 1.5Å) and ionizing gaseous molecules directly to remove electrostatic charges in inert gases too and ionizing the surrounding gases

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near the charged body, said method comprising the steps for:

painting Mo-Mn paste with silk screen on ceramics to get metallizing coat of a ceramic tube and then heating Mo-Mn paste under hydrogenous circumstances at 1,350°C for two hours and cooling said heated Mo-Mn paste;

5       plating non-electrolytic nickel on said metallized surface after said cooling;

deciding a filament's diameter according to the quantity of electrons to be generated after said nickel plating and turning the filament around a round steel bar predetermined times and pulling the bar out of the filament and coating the filament with LaBaO;

10      coating anode material on a Be window plate after said LaBaO coating, wherein the edge to be brazed is left not to be coated and accordingly filler metal consisting of Ag of 73% and Cu of 27% flows over said coated anode surface and prevents the efficiency from dropping;

coating W over the Be window plate by using a filtered vacuum arc source

15      (FVAS) coating device after said anode material coating;

performing high vacuum brazing by using an exclusive vacuum furnace and heating up temperature up to 900°C by using a Mo heater and increasing degree of vacuum up to  $4 \times 10^{-7}$  Torr by using a turbo molecular pump and a rotary pump;

20      making vacuum exhaustion of a tube up to a predetermined degree smoothly in case of brazing junction and making every material melt and form a body if temperature is over a melting point and embossing filler metal and brazing said embossed filler metal in order to keep the degree of vacuum as high as possible; and

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inserting a getter that is degassed at 450°C as a non evaporable getter consisting of Zr-Ni-V-Fe material positioning near an inner cathode and activated in order to increase the life of tube.

10. A soft X-ray tube manufacturing method as set forth in claim 9, wherein it  
5 is characterized in that said getter is fixed on the outer surface of a Ti cylinder of a cathode by welding in case of attaching a filament and said activated getter absorbs gases generated at the inner space of a closed tube and accordingly the degree of vacuum is kept for a long time and the life of said tube is prolonged.
11. A soft X-ray tube manufacturing method as set forth in claim 9, wherein it  
10 is characterized in that target voltage is 9.5KV and filament current is 150  $\mu$ A in order to generate soft X-ray.

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